
Human tissue-engineered small intestine forms from postnatal progenitor cells.

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Public Summary:

PURPOSE: Tissue-engineered small intestine (TESI) represents a potential cure for short bowel syndrome (SBS). We previously reported full-thickness intestine formation using an organoid units-on-scaffold approach in rodent and swine models. Transplanted intestinal xenografts have been documented to survive from human fetal tissue but not from postnatal tissue. We now present the first report of human TESI from postnatal tissue. **METHODS:** Organoid units (OU) were prepared from human small bowel resection specimens, loaded onto biodegradable scaffolds and implanted into NOD/SCID gamma chain-deficient mice. After 4 weeks, TESI was harvested and immunostained for beta2-microglobulin to identify human tissue, villin for enterocytes, lysozyme for Paneth cells, chromogranin-A for enteroendocrine cells, mucin-2 for goblet cells, smooth muscle actin and desmin to demonstrate muscularis, and S-100 for nerves. **RESULTS:** All TESI was of human origin. Immunofluorescence staining of human TESI reveals the presence of all four differentiated cell types of mature human small intestine, in addition to the muscularis and the supporting intestinal subepithelial myofibroblasts. Nerve tissue is also present. **CONCLUSIONS:** Our technique demonstrates survival, growth, and differentiation of postnatally derived human small intestinal OU into full thickness TESI in murine hosts. This regenerative medicine strategy may eventually assist in the treatment of SBS.

Scientific Abstract:

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